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INFLUENCE OF EXPANDING CONSTRUCTION ON
SHIPMENTS OF BUILDING MATERIALS



BY

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INTRODUCTION

A continued rise in construction activity in 1941 forecasts further increases in the demand for building materials of mineral origin. Recent studies by the Bureau of Mines, United States Department of the Interior, reveal that sales of mine and quarry products and their derivatives as a class have followed the long-term trend of construction activity in the past and are benefiting now by the upswing in all types of building.

At present most building materials of mineral origin are holding their own in the competitive arena. A few are slipping behind, but others have forged far ahead. Prominent among those that have surpassed general construction activity since 1925 are sand, gravel, and crushed stone (used in concrete and road metal and railroad ballast) and cement. Both building stone and roofing slate have followed the building curve closely, although in the last few years sales of roofing slate have risen above the curve and sales of building stone have dropped below it. Clay products and building lime, on the other hand, have lagged behind the general procession. Gypsum sales likewise dropped behind, but during the last few years, this industry, thanks to the wider acceptance of its newer products, has staged a marked recovery so that it now stands in about the same relation to total construction activity as it did in 1923-25.

TRENDS IN SALES OF VARIOUS MINERAL BUILDING MATERIALS

The Bureau of Mines study of long-term trends discloses that numerous factors affect the trends of the various mineral building materials and deflect their courses from the pattern of construction activity in general. Sales of materials such as sand, gravel, crushed stone, and cement, which are used extensively in maintenance and repair work, may not fall quite so low during the years of reduced building activity as those of materials such as lime, slate, building stone, gypsum, and clay products, which are used mainly in new construction. This condition is due to the cushioning effect of minor repair work which escapes inclusion to a greater or less

1/ The Bureau of Mines will welcome reprinting of this paper provided the following footnote acknowledgment is used: "Reprinted from Bureau of Mines Information Circular 7157."

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degree in most indexes of building activity. Moreover, shipments by producers may lead or lag behind the index of construction activity to a variable extent. Certain building materials are obtained from stocks maintained by a local dealer who must anticipate his sales requirements, with the result that shipments made by producers to dealers in building materials usually anticipate somewhat actual deliveries on the job. The opposite is true of building stone, which must be milled after the construction contract is let.

Importance of Different Types of Construction

Departures of certain building-material industries from the general building trend are explained partly by changes in the nature or relative importance of different types of construction. Although the production of clay products continues below the trend of total construction activity, it has paced closely the trend of residential building, which fared worse during the depression than construction activity as a whole. On the other hand, highway construction has risen so far above general construction activity as to account almost wholly for a large increase in shipments of gravel and crushed stone. Large public expenditures for highway construction and maintenance during the depression years checked the fall in production of these materials. In only the 3 years, 1932-34, inclusive, did production of gravel drop below the 1923-25 level and then by less than 10 percent.

Bright Outlook for Cement

Figure 1 compares total construction activity with shipments of cement and building stone over an extended period. Cement has followed the building pattern more closely than other building materials discussed in this paper. Since 1933, however, production of cement has forged ahead, probably because of the demand created by increased construction of dams and highways.

Total domestic shipments of principal hydraulic cements reached a peak of 178,052,000 barrels in 1928. In 1933 slightly more than one-third of this quantity was shipped, whereas in 1939 shipments of 125,057,000 barrels almost doubled the depression low. Shipments of portland cement alone in 1940 reached 130,315,000 barrels. In 1928 the production of finished portland cement was 72.3 percent of the indicated capacity, based upon producers' reports. In 1933 the portland-cement industry was running at 23.6 percent and in 1939 at 47.7 percent of capacity. It has been estimated by the Construction and Public Employment Section of the Bureau of Labor Statistics that cement valued at \$94,000,000 will be used in the defense construction program for projects authorized before November 1940. At the rate of \$1.47 per barrel (the average value in 1939) the demand would be 64,000,000 barrels of cement for this part of the defense construction program alone. As it has been estimated that private construction in 1941 will at least equal public construction, prospects of a continued large demand for cement are indeed favorable.

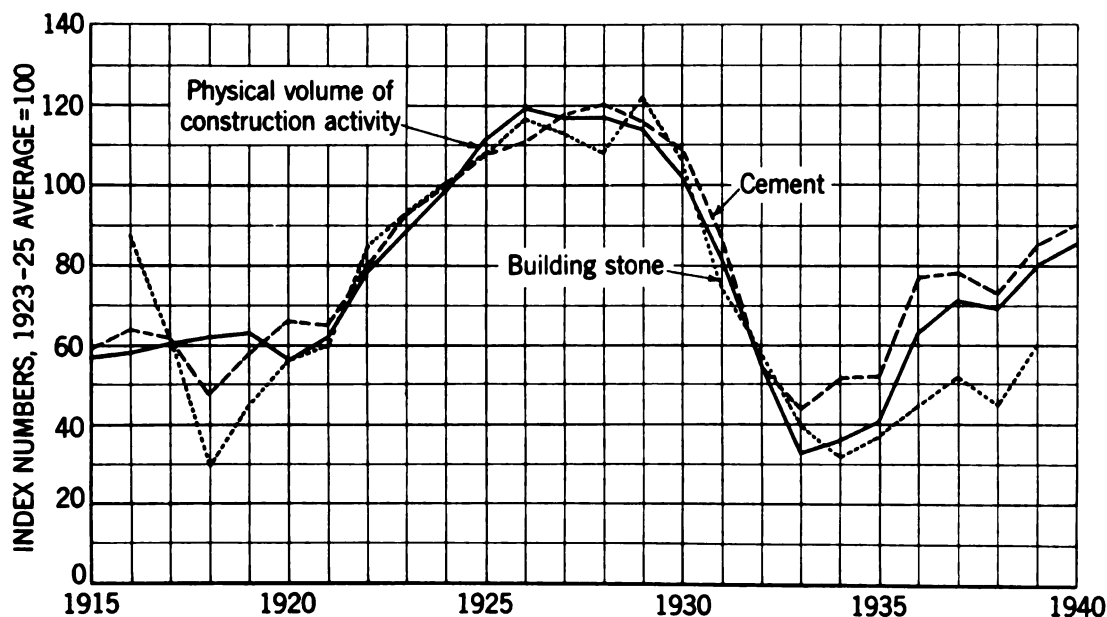


Figure 1.— Shipments of cement and building stone (all kinds) compared with physical volume of construction activity. Data on cement and building stone from Bureau of Mines and on volume of construction activity from Bureau of Foreign and Domestic Commerce.

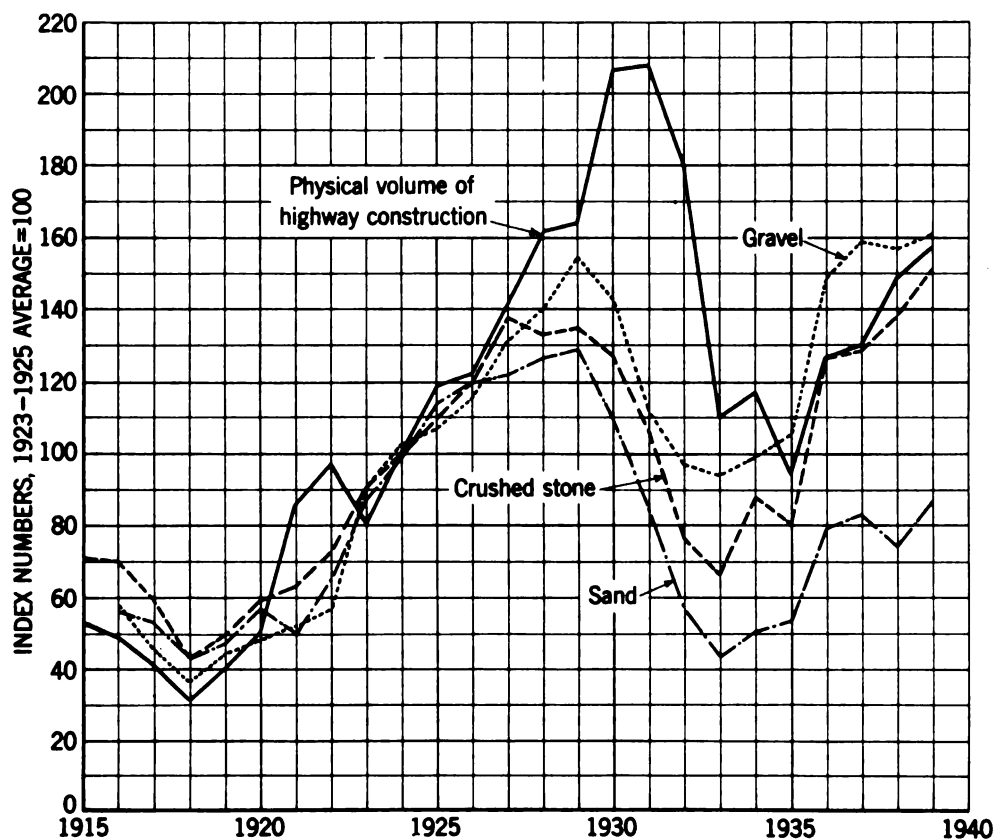


Figure 2.— Shipments of sand, gravel, and crushed stone compared with highway construction, 1915-39. Data on sand, gravel, and crushed stone from Bureau of Mines and on volume of highway construction from Bureau of Foreign and Domestic Commerce.

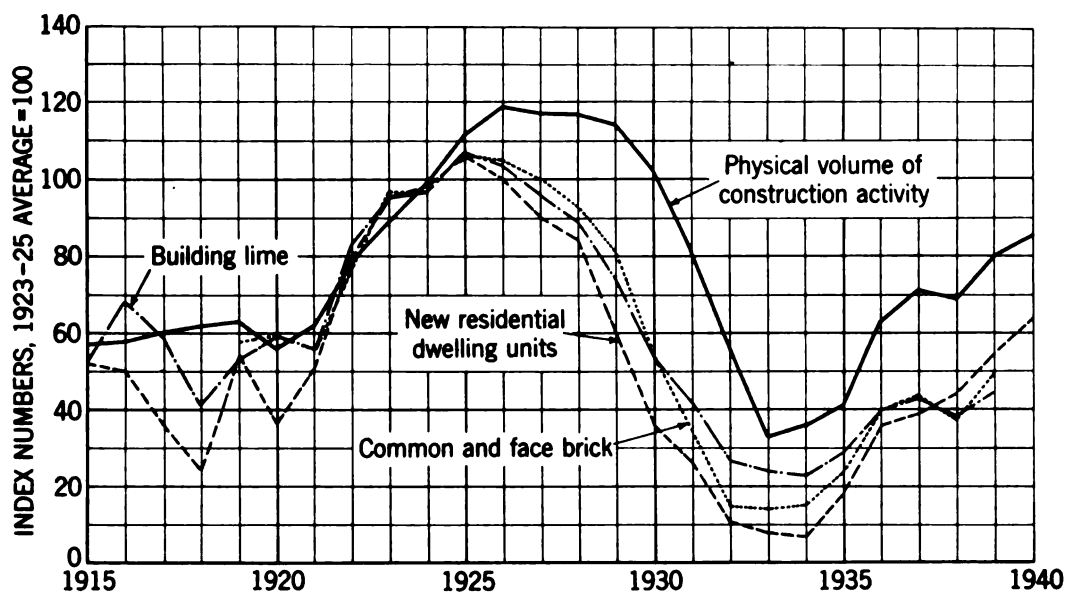


Figure 3.- Sales of building lime and production of bricks compared with building activity, 1915-39. Data on dwelling units from Bureau of Foreign and Domestic Commerce and Bureau of Labor Statistics; on brick from Bureau of the Census; on lime from Bureau of Mines; and on construction activity from Bureau of Foreign and Domestic Commerce.

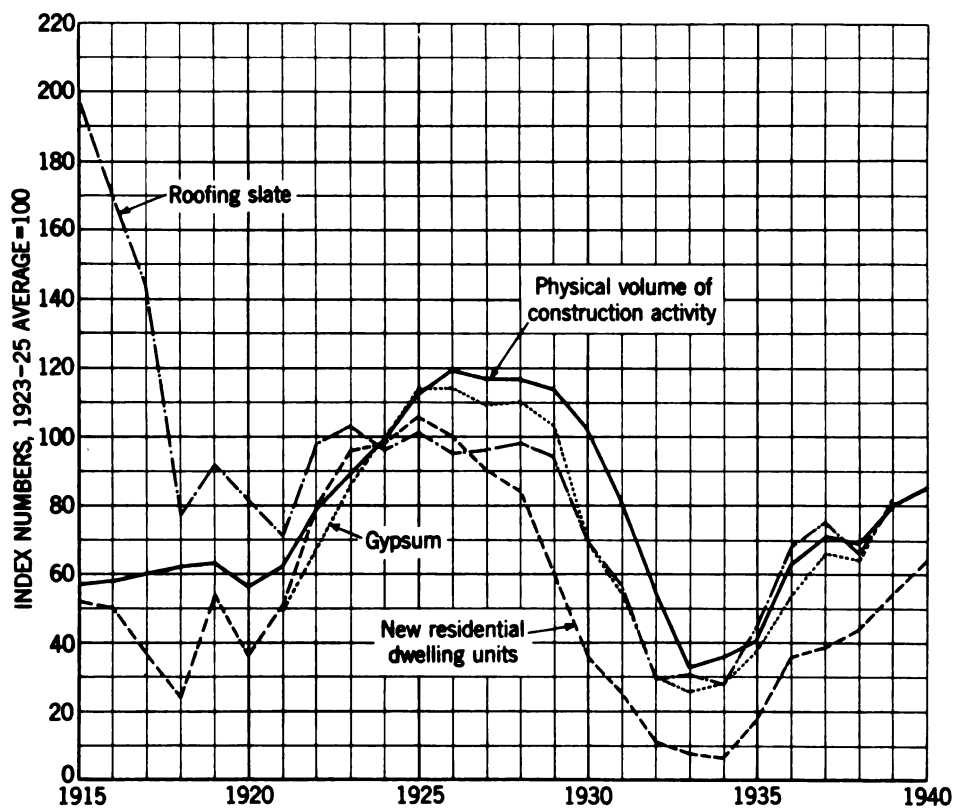


Figure 4.- Shipments of roofing slate and gypsum used for building compared with building activity, 1915-39. Data on roofing slate and gypsum from Bureau of Mines; on construction activity from Bureau of Foreign and Domestic Commerce; and on residential building from Bureau of Foreign and Domestic Commerce and Bureau of Labor Statistics.

Lagging of Building-Stone Sales

As indicated in figure 1, building stone has not recovered from the depression as much as most other building materials. In 1929, 34,761,000 cubic feet of dimension building stone were sold or used. By 1934 the quantity had fallen to 9,026,000 cubic feet, and in 1939, with 16,981,000 cubic feet sold or used, output had not yet reached half of that in the peak year 1929.

Of all dimension stone used for building in 1929, 51 percent was limestone, 18 percent granite, 14 percent sandstone, 8 percent marble, 1 percent basalt, and 7 percent other kinds. In 1934 these percentages were: Limestone 57, granite 28, sandstone 7, marble 6, basalt 1, and others 1. The increase in the relative importance of limestone continued through 1939, when the percentages were: Limestone 63, granite 18, sandstone 8, marble 6, basalt 1, and others 4.

Gain in Sales of Crushed Stone and Gravel

Figure 2 shows the relationship between the volume of highway construction and the production of crushed stone, sand, and gravel. Of these materials, gravel has fared best; in 1939 output reached an all-time high, more than 127 million short tons being sold or used. Crushed stone also broke all records in 1939, with over 103 million short tons sold or used. Production of sand, while ahead of general construction activity, has followed it much more closely and in 1939, with 67 million short tons sold or used, stood at 87 percent of the 1923-25 figure.

Although the large volume of highway construction has maintained production of crushed stone, sand, and gravel at higher levels than other building minerals, it was not adequate to counteract the sharp drop in the demand for all building materials in 1930, 1931, and 1932. Total construction fell about 70 percent between 1929 and 1933, and the number of new residential dwelling units dropped from 510,000 to 64,000.

Sand is closely related to the consumption of cement and, as stated, has followed the curve for total building more closely than crushed stone and gravel. Since 1927, gravel has fared better than crushed stone in the United States as a whole. Because the choice of these two materials depends to a large extent on local availability, their relative importance varies greatly in different sections of the country. It is evident from figure 2 that the great increase in highway construction since 1924 has had a most salutary effect on the gravel and crushed-stone industries.

Figures 3 and 4 illustrate the relationship of residential building to the production of materials used largely in this type of construction; namely, building lime, common and face brick, roofing slate, and gypsum. Building lime and common and face brick naturally are closely correlated with one another and with residential construction for which they are most in demand.

Decrease in Sales of Building Lime

Building lime has recovered less than brick, gypsum, or roofing slate. In 1939 production stood at only 45 percent of the 1923-25 level. Although the index of the quantity of building lime sold or used was above the index of residential building from 1925 to 1937, it dropped below in 1938 and continued below in 1939. One reason for the failure of building lime to return to higher levels is the wide substitution of various plaster boards and fiberboards for wall plaster, in which lime is an important ingredient. The 1,000,000 short tons of building lime sold or used in 1939 compares with 511,000 short tons in 1934 and 2,387,000 in 1925.

Common- and face-brick production, which fared worse than building-lime production during the depression, has made a slightly better recovery and now stands at 50 percent of the 1923-25 average. The output of common and face brick followed building more closely than that of hollow building tile during the decline from 1925 to 1933. Since that time, the curves of these three products have nearly merged, and since 1933 they have not quite kept up with the rise in the residential-building curve. The production of common and face brick dropped from over 10 billion in 1925 to less than 1.3 billion in 1933. The 1939 production was about 4.75 billion.

Production of building gypsum reached 82 percent of the 1923-25 average in 1939. The total quantity of calcined gypsum sold or used for building in 1939 was more than three times that in 1933, when slightly more than 1 million short tons were sold or used. Figure 4 shows the influence of the decline in residential building on the gypsum industry. Since 1934 the gypsum curve has followed total construction more closely than residential construction, probably owing to the more extensive use of gypsum products in all types of building.

Fluctuations in Sales of Slate

Since 1921 production of dimension slate (which includes all slate products except granules and flour) has followed the curve for total construction activity, and in 1939 it stood at 79 percent of the 1923-25 average. Sales of roofing slate (the most important type of dimension slate from the standpoint of production) dropped severely between 1915 and 1919; this decline is the most outstanding trend illustrated in figure 4. This precipitous decline, from which the industry has never recovered, doubtless is due to the extensive substitution of other roofing materials for slate. In 1915, 968,000 squares were sold by producers; in 1918 sales were 380,000 squares and by 1923 had risen to 508,000 squares. In 1924 the curve of roofing-slate production fell below the construction curves, but about 1927 it caught up with the residential-building curve and since that time has maintained a favorable position with respect to residential building, where it is chiefly used. In 1934 sales fell to 137,000 squares and in 1939 totaled 399,000 squares. Production of flagstone and walkway slate, although a small part of the total output of slate, has nearly reached its predepression high, whereas production of blackboard and bulletin-board slate and of structural and sanitary slate has remained almost at depression lows, reaching 45 percent and 43 percent, respectively, of the 1923-25 levels in 1939.

High and Low Points in Sales of Building Materials

Table 1 compares the extent of fluctuation in the production of building materials of mineral origin. Materials used extensively in residential building reached their peak around 1925, while materials depending largely on highway construction reached their highest point about 1929. The years 1933 and 1934 were the poorest for nearly all the materials, whereas in 1939, the latest year for which data are available on most commodities, all the building materials were advancing definitely toward recovery.

TABLE 1. - High and low points in sales of building materials

(Index numbers, 1923-25 average = 100)

	Predepression high	Depression low	Recovery high
Materials:			
Cement.....	120 (1928)	44 (1933)	<u>1/</u> 90 (1940)
Sand.....	129 (1929)	43 (1933)	87 (1939)
Gravel.....	155 (1929)	94 (1933)	161 (1939)
Crushed stone.....	138 (1927)	66 (1933)	151 (1939)
Building stone.....	122 (1929)	32 (1934)	60 (1939)
Roofing slate.....	197 (1915)	28 (1934)	81 (1939)
Building lime.....	107 (1925)	23 (1934)	45 (1939)
Building gypsum.....	114 (1925 and 1926)	26 (1933)	82 (1939)
Common and face brick...	106 (1925)	14 (1933)	50 (1939)
Barometers:			
Physical volume of construction activity.....	119 (1926)	33 (1933)	<u>1/</u> 85 (1940)
New residential dwelling units.....	106 (1925)	7 (1934)	<u>1/</u> 84 (1940)
Physical volume of highway construction.....	203 (1931)	94 (1935)	157 (1939)

1/ These figures are preliminary and are the only 1940 data available.

TRENDS IN IMMEDIATE FUTURE

It is doubtful whether the relationship of the various building minerals to the type of construction primarily responsible for their utilization will change materially during the next few years.

Trends in sales of mineral building materials in 1940 and 1941 may be judged to some extent by the estimated volume of construction activity for these years. The F. W. Dodge Corporation estimated a 13-percent increase in total construction contracts awarded in 1940 over 1939 and anticipates a further 14-percent increase in 1941. They predict a rise of 11 percent in residential construction awards in 1941, which would follow the estimated rise of 20 percent in 1940. Highway construction dropped about 10 percent in 1940, when much of the P. W. A. work was curtailed. A small gain is predicted in general highway construction in 1941, but with the large increase expected in airport and runway construction during the year the demand for mineral products used extensively in highway construction should continue strong.